New Federal Regulations

Carbureted 2-stroke outboard motors are the most commonly used engines on motorboats. Because of the way they are designed, 20 to 30 percent of the fuel used to power them never gets burned and is emitted into the water and air. Recognizing this problem, the U.S. Environmental Protection Agency developed regulations that require outboard motor manufacturers to develop cleaner engines. These regulations will be phased in over a period of many years, but the cleaner engines are available for sale now! They cost a little more, but they burn less gas and are much quieter than the older motors. You can help reduce the pollution of Vermont's waters and air by replacing your outboard with one of the newer 4-stroke or direct fuel injection 2-stroke outboard motors.

The new 4-stroke and 2-stroke outboard motors are:

- ☑ Cleaner
- ☑ Quieter
- ☑ Fuel-Efficient
- ☑ Better for the Environment

Maybe it's time to upgrade your outboard!

Boating is a popular activity, but we need to be environmentally responsible about it. Check out the new outboard motors and learn how you can help keep Vermont's air and water clean.

For further information contact the following offices of Vermont's Department of Environmental Conservation:

Air Pollution Control Division (888) 520-4879
Water Quality Division (802) 241-3777
Web Address: www.anr.state.vt.us/dec

Vermont Agency of Natural Resources
March, 2000

Vermont Department of Environmental Conservation

New, Economical

and

Environmentally Friendly

Outboard Motors

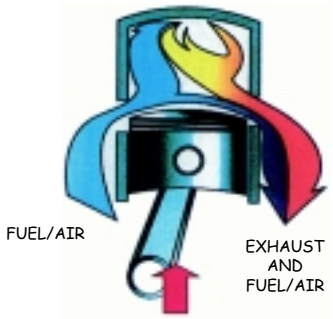
Help Keep Vermont's Air & Water Clean

The Problem with Carbureted 2-Stroke Outboard Engines

Vermont's beautiful lakes and rivers provide many opportunities for boaters to enjoy the water. Boating is very popular and the number of motorboats in Vermont continues to increase. Unfortunately, most motorboats and personal watercraft (PWC) on Vermont's waters use carbureted 2-stroke outboard engines. No matter how well tuned, these engines **lose approximately 20 to 30 percent of their fuel** as it passes through the combustion chamber unburned. **For every 10 gallons of gasoline used, two to three end up in the air and water!** An estimated 500,000 to 750,000 gallons of fuel is emitted unburned into Vermont's lakes and ponds every year!

Gasoline is toxic! It contains hundreds of chemical compounds, many of which are known or suspected of causing cancer. **It is in everyone's best interest to keep gasoline out of the air and water.** The good news is that cleaner, advanced technology outboard motors are now available.

Carbureted 2-Stroke Engine



During the piston's down-stroke the intake and exhaust ports are both open. This allows some fuel to pass straight through without being burned.

New Technology - Cleaner Engines

Fortunately there is a new breed of efficient engines available from marine engine dealers. These engines are much cleaner and meet federal regulations that are scheduled to take effect in 2006. The outboards come in two types: 4-stroke engines, which have been around for years in lower horsepower ratings, and the newer direct fuel injection (DFI) 2-stroke engines which propel higher horsepower outboards and PWCs.

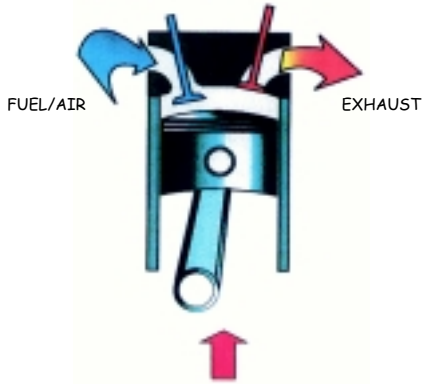
4-Stroke Engines

Four-stroke engines are the cleanest outboard motors and are currently available in horsepower ratings up to 130 hp. The intake and exhaust valves are never open at the same time. This prevents unburned fuel from escaping the combustion chamber.

Four-stroke engines run on straight gasoline, so you never have to mix oil with the gas.

Four-stroke engines are quiet, and are the most fuel- efficient outboard motors available.

4-Stroke Engine

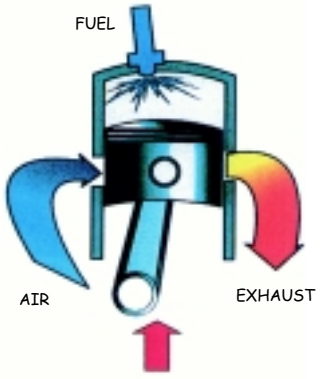


The 4-stroke engine never operates with both the intake and exhaust valves open at the same time. This prevents unburned fuel from escaping the combustion chamber.

Direct Fuel Injection

Two-stroke engines with direct fuel injection (DFI) spray fuel into the cylinder after the piston covers the exhaust port on the up-stroke. The fuel is injected into the top of the cylinder next to the spark plug. While this technology isn't as efficient as a 4-stroke engine, it is much cleaner than the carbureted 2-strokes. DFI engines also reduce oil use by 50 percent over conventional carbureted 2-stroke outboard engines. They are currently available in horsepower ratings from 90 hp to 225 hp.

DFI 2-Stroke Engine



DFI engines inject fuel into the cylinder after the exhaust port is blocked by the piston.

The new 4-stroke and DFI engines cost about 20 percent more than the old carbureted 2-stroke engines. However, they burn 30 to 50 percent less gas, save on oil use, and in a short period of time save the consumer money. And you can feel good about using a motor that's better for the environment.